

## 4—THE ESSENTIAL OILS OF THE WESTERN AUSTRALIAN EUCALYPTS.

## PART VIII.

THE OILS OF *EUCALYPTUS CAMPASPE* S. MOORE AND *E. KOCHII* MAIDEN ET BLAKELY.

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WITH A NOTE ON *E. campaspe*.

By C. A. GARDNER.

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**Eucalyptus campaspe.**

The oil of *E. campaspe*, distilled from material collected at Widgiemooltha in October, 1922, has been described by Phillips (1). It was shown to consist largely of hydrocarbons, having a low solubility in alcohol, although esters and alcohols made up more than 20 per cent. of the oil and the aldehyde content was estimated at 8 per cent. The cineole content of the oil was given as about 15 per cent.

The oil described in the present paper was distilled from leaves collected in April, 1942, about a mile north of the Lloyd George Mine at Gibraltar, that is, about 12 miles roughly south-west of Coolgardie. The branchlets were taken from a tree about 25 feet high, growing in heavy red loam on a flat between two auriferous ridges. It was collected by Mr. G. E. Brockway and its identity was verified by Mr. C. A. Gardner. The distillation was complete in 3 to 4 hours and the yield was a little over 1.2 per cent. by weight calculated on thoroughly air dried material. The oil was yellow in colour and had a somewhat irritant though camphoraceous odour. A comparison of the more important physical and chemical properties of this oil with those of the oil distilled by Phillips shows that the two differ markedly from one another. The most notable differences lie in the very much higher cineole content (which accounts for the higher solubility in alcohol, the higher specific gravity and lower refractive index) and in the lower aldehyde, alcohol and ester content of the present oil.

	Phillips.	Watson.
Yield .....	0.72%	1.22%
Specific Gravity at 15°C. ....	0.9118	0.9225
Refractive Index at 20°C. ....	1.4762	1.465
Optical Rotation .....	+ 5.43°	+ 7.15°
Solubility in 80 per cent. alcohol .....	In 5 volumes	In 1 volume
Saponification Value (cold) .....	.....	1.1
Saponification Value (hot) .....	8.4	3.5
Alcohols calculated as C <sub>10</sub> H <sub>18</sub> O .....	18.65%	9.4%
Aldehydes .....	8% (a)	1.8% (b)
Cineole .....	15% (c)	64% (d)

(a) By absorption; (b) by hydroxylamine, calculated as C<sub>10</sub>H<sub>14</sub>O; (c) by phosphoric acid; (d) by *o*-cresol.

The oil was soluble in 10 volumes of 70 per cent. alcohol, had an acid value of 0.3 and contained 7.2 per cent. of geraniol. It gave the usual colour reactions for aromadendrene. The cold saponification value corresponds to nearly 0.4 per cent. of geranyl acetate, while the hot value corresponds to a little over 1.2 per cent. of total esters calculated as C<sub>12</sub>H<sub>20</sub>O.

NOTE ON *EUCALYPTUS CAMPASPE*.

The disparity in the oil produced from specimens received from Widgiemooltha and Coolgardie may perhaps be explained by the difference between what appear to be two distinct forms of this species. Until ripe fruits have been obtained from Coolgardie we are not in a position to decide the true status of this form, and the position is rendered still more difficult by the fact that the type specimen is without fruits. The type was collected by Spencer Moore at Gibraltar in October, 1895, and was described by him in 1898 (2).

The species is represented in the Perth Herbarium by two sheets from Widgiemooltha, bearing buds, flowers and fruits (Gardner 1015 and 1043) and a single sheet from Montana Hill, Coolgardie (Gardner *sine no.*), with buds, flowers and immature fruits. The ripe fruits from Widgiemooltha show conspicuously exerted broadly deltoid valves, while unripe fruits from both localities, in which the capsule is undeveloped, exhibit a prominent calycine rim produced above the level of the ovary. I have not examined the type specimen at the British Museum (Natural History) but Maiden has illustrated the buds, together with specimens obtained at Coolgardie (L. C. Webster) and Fraser's Range (Helms) (3). The differences here are well marked between Webster's and Helm's specimens. In the absence of fruits from the type, it is not possible to make full comparisons, but, in the type specimen and in the specimens from Widgiemooltha and Fraser's Range, the operculum is longer than the calyx-tube, while in the Coolgardie specimens it is shorter and both the buds and the immature fruits are much larger. The differences are as shown hereunder.

	Coolgardie specimen.	Gibraltar (Type).	Widgiemooltha specimens.
Peduncle	10 mm. long, up to 5 mm. broad	6-8 mm. long, 3-4 mm. broad	6-9 mm long, 4-5 mm. broad
Buds	Broadly obovoid	....	ovoid to narrow- ovoid
Calyx-tube	4-5 mm. long, 7-8 mm. broad	4 mm. long, 6 mm. broad	3-4 mm. long, 5 mm. broad
Operculum	4 mm. long	6 mm. long	5-6 mm. long
Unripe fruits in similar stages	10 mm. diameter	....	5 mm. diameter

The Coolgardie specimens have more pruinose branchlets and more glaucous leaves than those of the Widgiemooltha specimens. The principal differences, however, are in the shape of the buds and the size of the fruits. The type would appear, from its description, to be closer to the Widgiemooltha and Fraser's Range forms than to the form obtained from Coolgardie.

C.A.G.

***Eucalyptus Kochii*.**

This species was established by Maiden and Blakely from specimens collected near No. 2 Rabbit Proof Fence, some 50 or 60 miles east of Watheroo. The material used in this investigation represents the only other recorded occurrence of the species and it was obtained about 8 miles east of Canna, more than 100 miles roughly north-west of its previous location.

It was collected at the end of November, 1944, by members of the Drug Panel of the Department of Industrial Development, and its identity was determined by Mr. C. A. Gardner. Further samples were collected from the same mallees two months later, when the mature plants were flowering and fruiting. Three specimens of oil were distilled, one from branchlets of both young and mature mallees, the latter in bud, collected in November; a second from the same young mallees alone and a third from the mature mallees bearing buds, flowers and fruits. The last two were collected in January, 1945.

The oil distilled rapidly and distillation was complete in about 3 hours. The yield varied from 2.1 per cent. by weight from undried leaves and branchlets to almost 3.9 per cent. from nearly dry material. The oil varied in colour from pale yellow to yellow and its odour was faintly irritant. The three specimens consisted very largely of cineole, the proportion ranging from 85 to 92 per cent. and the crude samples themselves conformed to the requirements of the British Pharmacopoeia for eucalyptus oil. The growth of the young mallees is luxurious and appears to be vigorous and, although the distribution of the species is not known at present, it seems evident that it could be closely cultivated on the outer fringe of the wheat belt.

The main physical properties and the cineole contents of the samples examined are as follow:—

Sample.	Specific Gravity.	Refractive Index.	Optical Rotation.	Solubility in 70% Alcohol.	Cineole Content.
1.	0.922	1.460	+1.9°	In 2.0 vols.	87.5%
2.	0.921	1.460	+3.8°	In 2.1 vols.	85.0%
3.	0.925	1.4595	+0.54°	In 1.8 vols.	92.0%

Sample 1 from mature mallees in bud and young mallees, collected 30th November, 1944.

Sample 2 from young mallees, collected 27th January, 1945.

Sample 3 from mature mallees bearing buds, flowers and fruits, collected 27th January, 1945.

The differences between these samples are such as would be expected from the lower cineole content and probably a slightly higher terpene content of samples 1 and 2. Sample 1 had an acid value of 0.7, cold and hot saponification values of 1.1 and 2.4 respectively and contained 0.023 millimole of aldehyde per gram, equivalent to 0.35 per cent. of aldehydes calculated as  $C_{10}H_{14}O$ . It gave no test for phellandrene.

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#### REFERENCES.

- (1) Phillips, 1922-23, *Journ. Roy. Soc. W. Aust.* Vol. IX., p. 107.
- (2) Moore, 1898, *Journ. Linn. Soc. Lond. (Botany)*, 34, p. 193.
- (3) Maiden, *Critical Revision of the Genus Eucalyptus*, ii, plate 71.